

## EDITORIAL ARTICLE.

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### SURGICAL ANALGESIA BY SPINAL COCAINI-ZATION.

THE most prominent, if not the most important, outcome of the work of the Surgical Section of the Thirteenth International Medical Congress held at Paris this year is the popularity given by Tuffier to the method of producing surgical analgesia by the injection of cocaine into the subarachnoid space in the lumbar region. Originality in this procedure is not claimed by Tuffier, the credit of first employing it being generally given to Bier, of Kiel. It was not until attention was called to the fact that Dr. Leonard Corning, of New York, had not only suggested spinal cocaineization, but had actually employed it for surgical purposes, that the credit was likely to be placed where it properly belonged. It is to be deplored that want of familiarity with American scientific literature has led our European brethren in this instance, as upon occasions in the past, to ignore the original work done on this side of the Atlantic, with all the possibilities of acrimonious debate as a result. Certain it is that Corning's name has not been mentioned in connection with this method except by his own countrymen; yet it cannot even be urged in excuse for this that the language in which he described his animal experiments is uncertain, or the journal in which he published both the experiments and the application of the method to the human subject is obscure.

Aside from the question of priority, the most interesting point in regard to the whole matter is the applicability of the method to the work of the every-day surgeon. This at once brings up the question of the possibility of its superseding the

anaesthetic agents now in common use, namely, ether and chloroform. Apart from questions relating to the relative risks run in the use of the two methods, this question must be answered in the negative at the present time. Although a large number of operations may be done in less than an hour, and the operating field below the diaphragm offers a wide area for surgical work, yet there are many most important operations that must take upon an average a longer time than the analgesia from spinal cocaineization can be expected to last, some of which are located below the diaphragm, as well as many minor procedures above that point. So that, what with necessarily prolonged operations below the average height of the analgesia, and these as well as shorter operations above this point, there is a wide operative field yet to be covered before the reign of ether and chloroform can be said to come to an end.

The next consideration relates to the risks of the procedure itself. No deaths have yet been definitely reported from trustworthy sources; although it is a well-known fact that such have occurred, and that rather suddenly, where simple lumbar puncture has been made as an aid to diagnosis in obscure spinal and cerebral lesions and neoplasms, particularly the latter. Since no injections were made in these cases, and since, in addition, the symptoms which occur to a more or less extent following cocaineization are quite as constantly present in simple puncture, the action of the drug itself must be largely discounted in estimating the risks of the procedure, as it is performed for surgical purposes in subjects presumably healthy as to their spinal and cerebral regions, especially in view of the small amount of the analgesic agent employed. In view of these facts, our attention may be more profitably turned in this connection to the possibilities of inflicting mechanical injury, and to the chances of carrying septic material into the subarachnoid space through errors in the aseptic portion of the technique, as well as to the susceptibility of the spinal and ultimately the cerebral meninges to such infection.

As to mechanical injury, the risks of inflicting such upon important structures is insignificant. In this connection the extradorsal structures may be left out of the consideration. Aside from the slight puncture of the meningeal walls of the cavity itself, there is only a remote possibility of the needle piercing the nerve structures, the cauda equina floating loosely about in the cerebrospinal fluid and escaping the needle with a short or blunt bevel, which should always be employed. Even should these nerve structures be invaded, it is highly improbable that serious damage will be inflicted, as much more important nerve structures, and even parts of the central nervous system, have repeatedly been explored in a similar manner, and without the slightest evidence of disturbance resulting.

The question of septic complications following the puncture and injection is of sufficient seriousness to engage the careful consideration of those who avail themselves of the new method, and who by so doing give their sanction to its use at the hands of others. It is manifestly impracticable to restrict its use after it has once found favor among those who are looked upon as authorities in surgical matters, and who, it may well prove to be, are competent to use it with perhaps even less risk than attends ordinary anaesthesia. Yet it would be most unfair and unprogressive not to attempt to determine by actual use its applicability to surgical practice for fear that, should its employment be followed by flattering successes, it might be applied by those in whose hands it would be conducive to harmful results. For, just as in the days when Lawson Tait first published his remarkable (for those days) experiences in abdominal surgery, and there came into existence numberless would-be laparotomists who possessed but little skill and less conscience, so in the present instance there will spring up a host of individuals who will employ the method to its detriment and the discredit of the profession.

But these risks must be taken as in all things new in surgery which require experience in their use in order to learn their risks,

establish their value, define the limits of their application, or determine their worthlessness.

To what extent the spinal meninges are susceptible to the ordinary micro-organisms which are likely to be carried into the canal, and what risks in this respect the patient runs beyond what ordinary surgical preliminary care can provide against, has not yet been determined. It is not to be supposed that the spinal meninges are fool-proof, any more than are the peritoneum or the cavities of joints. While it is true that the man who is fit to do operative surgery at all is fit to practise this procedure, on the other hand it is to be hoped that those who do but little surgery, and that of an emergency character, will realize their shortcomings in respect to the asepsis required for this method of insuring to the patient a painless operation, and employ one or another of the general anaesthetics. The occurrence of suppuration following the infliction of an operation wound is not incompatible with final recovery, even in cases of abdominal section or arthrotomy; but the patient who develops an infective meningitis as the result of a spinal puncture with a dirty needle is absolutely and positively doomed, nor can the surgeon who is responsible for his condition lift his hand to aid him.

While, therefore, it is highly proper that the skilled and careful operator whose daily work is one of aseptic details, the carrying out of which have become second nature to him, should gather experience and knowledge concerning, and help the world to reap the benefit of whatever is of value in the new method, it is only fair that a note of warning should be sounded for the benefit of those who, little realizing what may happen, may, in the absence of such warning, sacrifice human lives and place in jeopardy a discovery that may yet prove to be an almost inestimable boon to humanity.

In all the articles which have appeared upon the subject there has been a noteworthy absence of any attempt to explain the precise manner in which the cocaine acts upon the sensory

nerve structures, save by the indefinite statement that it acts "through the circulation." The observations of Lenandowsky are of interest in this connection, who asserts that the cerebrospinal fluid is a specific product of the brain and partakes of the nature of lymph. He showed by experiments that such agents as strychnine and ferrocyanate of sodium when introduced into the subdural space and mingled with the cerebrospinal fluid passed directly into the nerve substance through its lymph channels and without the intervention of the circulation. Confirmation of these experiments must lead to the inevitable conclusion that the cocaine gains entrance into the nerve substance in the same manner. This will also explain the extreme rapidity with which analgesia is effected in some cases, the extremely small dose required, and the absence of some of the characteristic toxic effects of the drug; for, in spite of what has been said about the headache, nausea, and vomiting, and other symptoms erroneously attributed to the effects of the drug, these are not the symptoms of cocaine poisoning as met with after its use by subcutaneous injection or in the shape of concentrated spray solutions; as has been already pointed out, they follow spinal puncture when no injections are made, or when a simple saline solution is injected. It has developed in the course of the writer's experience with the method that quite as uncomfortable symptoms have followed the use of five minimis of a 2 per cent. solution as of thirty minimis, and that likewise the amount of cerebrospinal fluid withdrawn bears no relation to the after effects. In upward of forty cases the patient who suffered the least from the after effects lost the most cerebrospinal fluid. In an attempt to determine the least amount that would effect analgesia, it was found that five minimis of a 2 per cent. solution were not sufficient to produce analgesia in the popliteal space of a lad of nine; an additional five minimis being injected, and then with only indifferent results; while five minimis of the same solution mixed with twenty-five minimis of a 4 per cent. solution of antipyrin were amply sufficient

for the purposes of an extensive haemorrhoid operation by the cautery method in a vigorous man. It may be of interest to state in passing that the after effects in this last case were more pronounced than in any of the others. This brings up the question of the use of mixtures of cocaine with such drugs as antipyrin,—mixtures which have been found by dentists to be of value in producing analgesia by cataphoresis, lessening the amount of cocaine required.

It seems to be pretty clearly shown that, in our present state of knowledge concerning the *modus operandi* of the method, it is impossible to determine beforehand either the extent of the analgesia or the length of time that it may be expected to last. In the writer's cases it would seem that, with the present weak solutions and small quantity of the drug employed, these are quite sufficient for those who are susceptible to the influence of the agent, and not enough for those who are insusceptible, affecting these latter over a less area and in a more transient manner. The behavior of the cases suggested that either larger quantities of the drug must be employed or measures taken to effect its distribution over a larger area. It may be that the former proposition will be the first to be entertained, particularly in view of the fact that what has been supposed to be the toxic effects of the drug are not really due to this cause at all.

As to the effects of intraspinal injections upon the cord itself, Nicoletti, of Naples, has shown by animal experiments that no histopathological lesions of the nervous system followed subarachnoid injections. In the writer's cases Dr. William Browning, of Brooklyn, investigated the condition of the patients from the neurological stand-point at various periods of time following the injection, with negative results.

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